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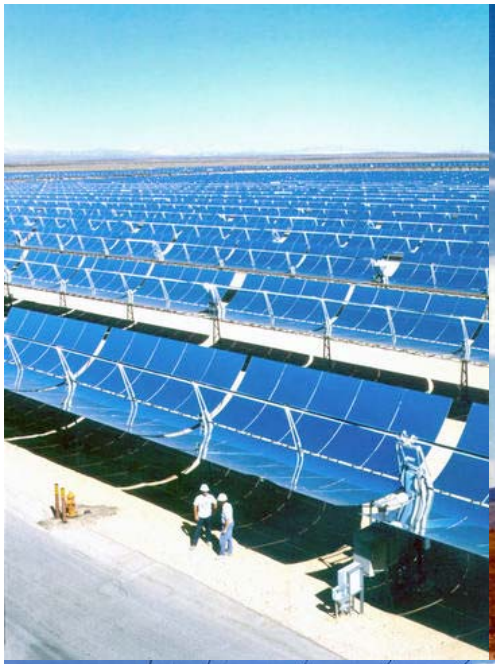


Western Wind and Solar Integration Study

Debbie Lew

Technical Review Committee Conference Call

Mar 12, 2008

earch Institute • Battelle

Agenda

- Update on overall progress
- Solar penetration levels (PV and CSP)
- Wind turbine power curve
- Wind Site Selection
- Conference calls/Meetings

Task Progress

- Kick-off Meeting (5/07) - NREL
- Data Collection (6/07-2/08)
- Preliminary Analysis (2/08-7/08) - GE
  - Extensive statistical analysis with various options for wind/solar sites and transmission
- Scenario Development (7/08) - GE
  - Including individual control areas vs. single control area and high solar penetration
- Stakeholder Meeting (first half of August '08) at NREL
  - Review analysis and provide input to scenarios
- Run Scenarios (8/08-1/09)
- Interim Technical Results Meeting (late '08) conf call

Solar Penetration Levels

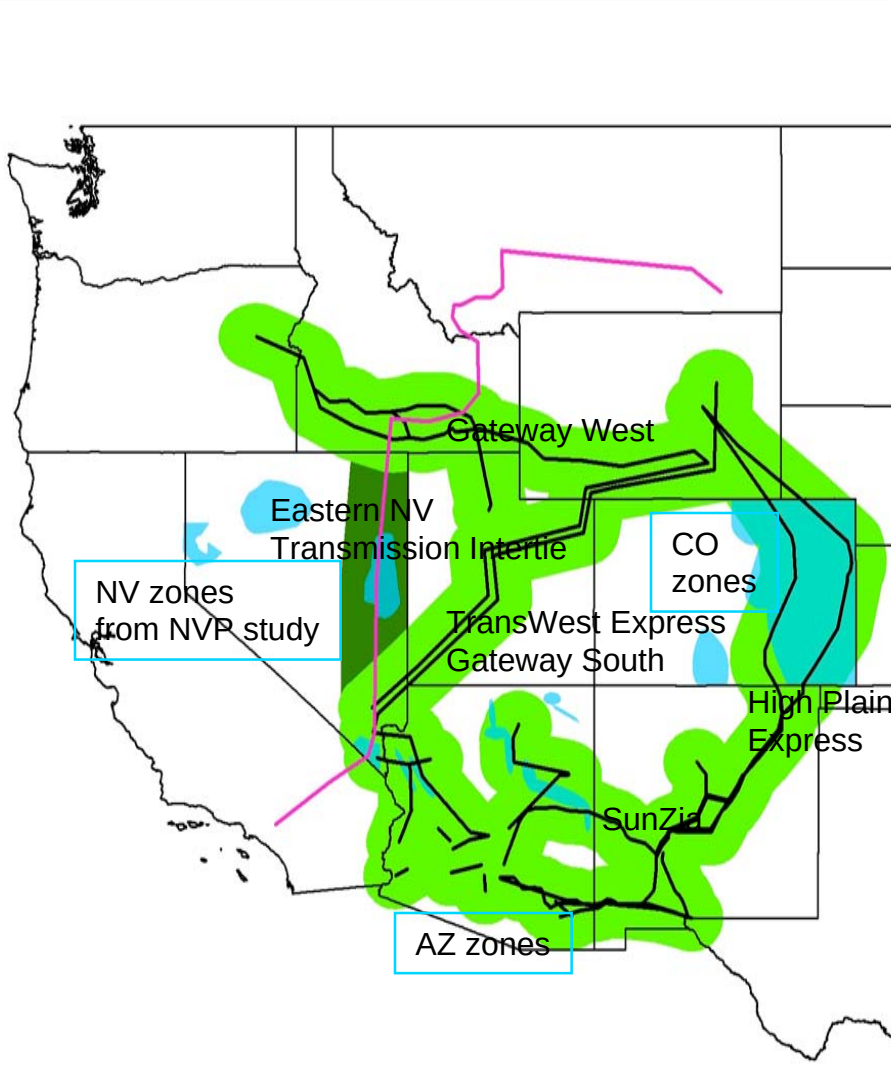
- CSP modeled is trough w/6 hours storage
- Other studies:
  - California IAP 2020 - 2.9GW PV and 3.1GW CSP
  - WECC 2017 - additional 1.8 GW CSP in basecase, 8-10 GW CSP in high solar
- Propose for our study:
  - Basecase
    - 30% wind/5% solar inside study footprint - 31 GW wind, 2.6 GW PV, 2.6 GW CSP
    - 20% wind/3% solar outside study footprint - 40.6 GW wind, 3 GW PV, 3 GW CSP
    - Totals for US WECC - 72 GW wind, 5.6 GW PV, 5.6 GW CSP
  - High solar scenario - 10-20% solar

Wind Turbine Power Curve

- Currently modeled Vestas V90 3MW using SCORE-lite
  - Modeled high wind behavior exaggerates ramps
- Options
  - Use Bonus 1.3MW wind farm power curve from Nine Canyon, Kennewick, WA
  - Take tail from averaged Bonus wind turbine power curves, apply to GE 1.5MW turbine which is more common, and use SCORE-lite to eliminate specific Nine Canyon effects
  - Modify SCORE-lite files to include hysteresis in power curve

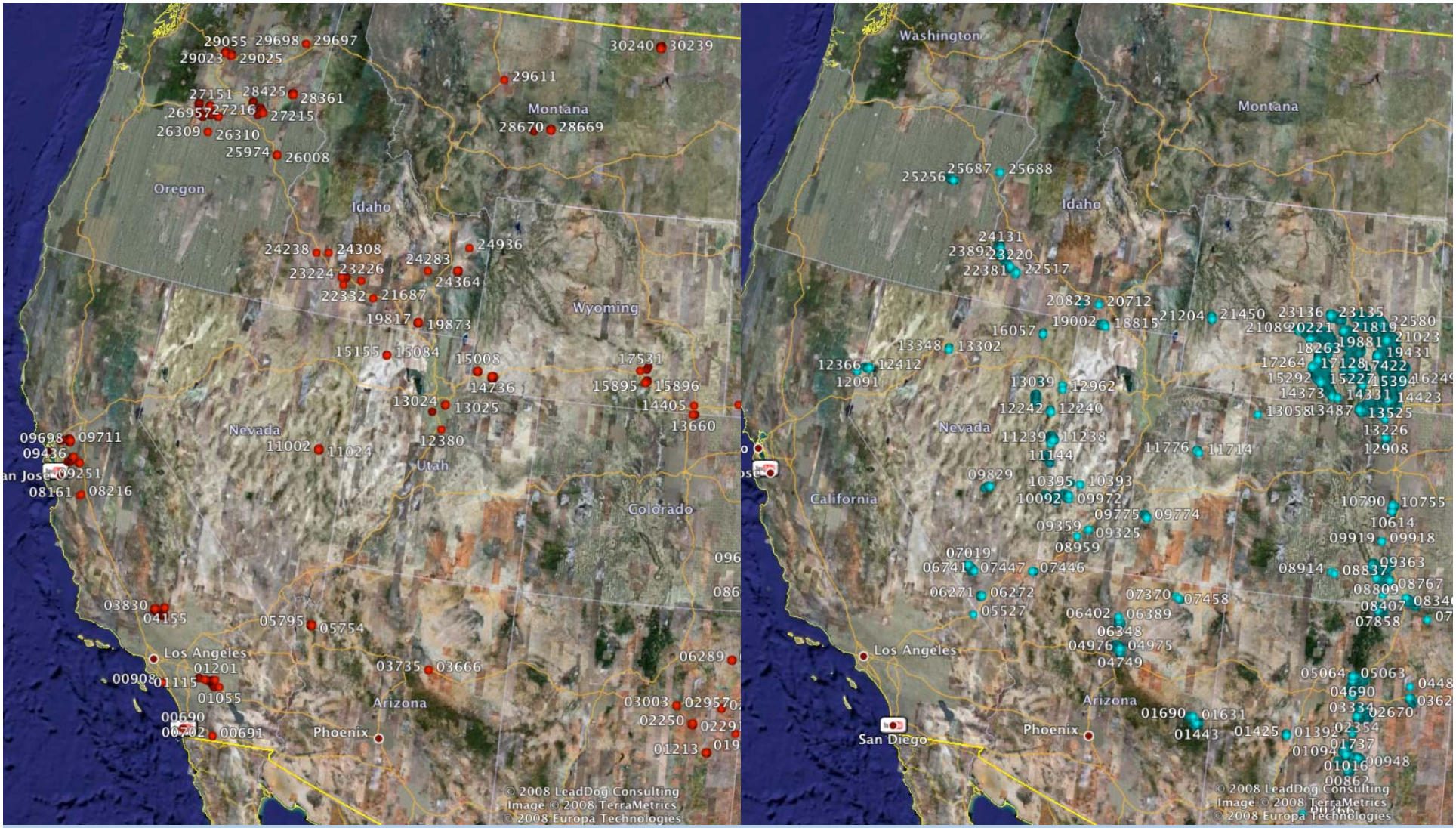
Two levels of wind site selection

- 3Tier downselected from 1.2M to 30k points so that we could work with something reasonable.
  - Exclusions - recreation, urban, forests, slopes, high elevation, etc.
  - Preselected sites - existing or planned wind plants from Platts database
  - Transmission corridors or zones - based on proposed new transmission and initial zone information (excl new NV zones)
  - Load correlation - best diurnal correlation with Westconnect load
  - Best resource - best wind power density
- GE will downselect from 30k to 2-5k points to develop scenarios for simulation.



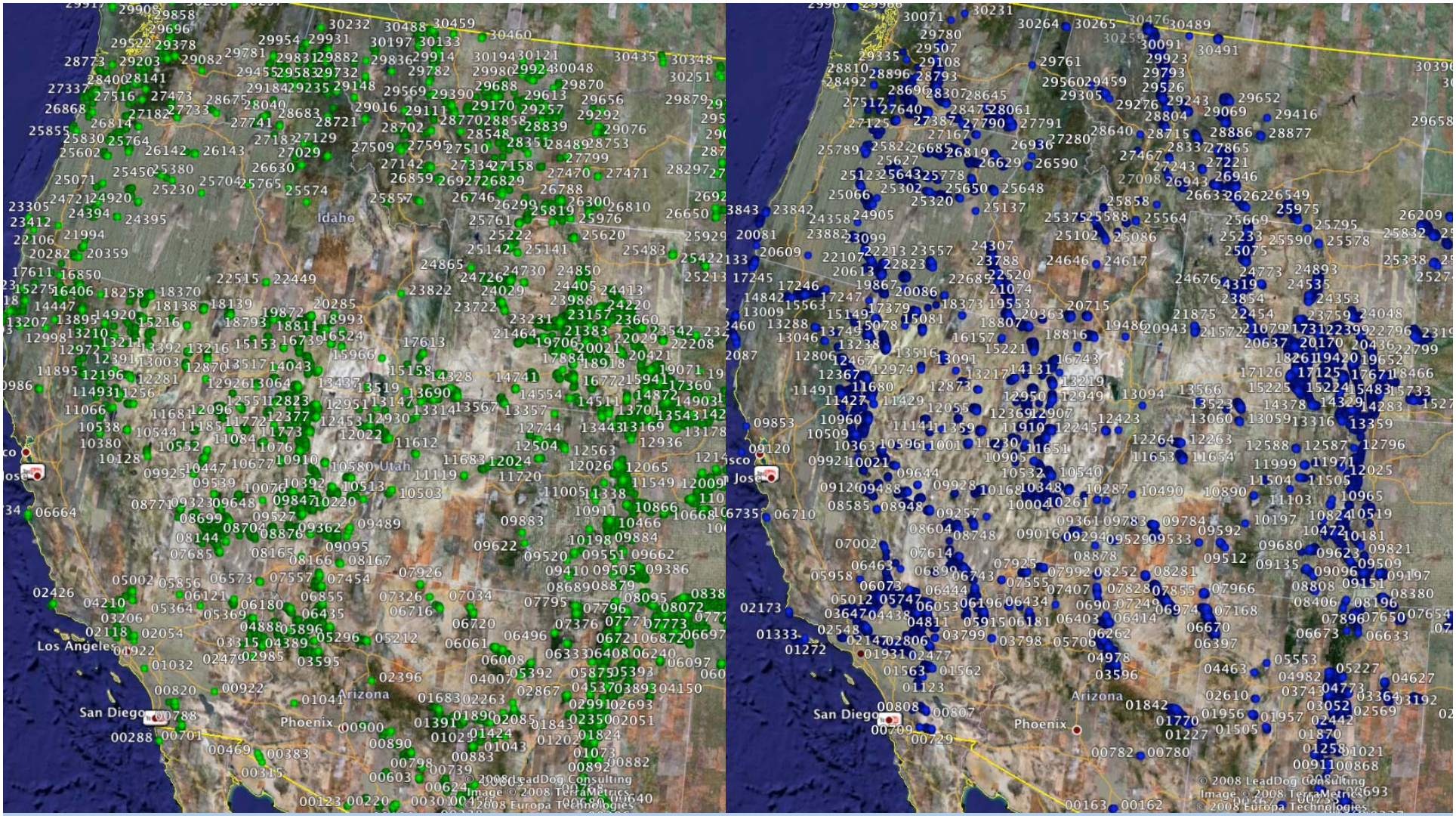
Preselected

Transmission corridor/zone



Load correlated

Best resource



Your input is requested

- Are there sites that you think are likely to be developed in the next two decades that we should model?
- Of the sites that have been selected, what areas do you think should be excluded in GE's site selection process?
- Of the sites that have been selected, what areas do you think should be included in a 30% wind penetration scenario?

Other Issues

- Should we have monthly TRC calls/webinars?
- Stakeholder Meeting to review statistical analysis and proposed scenarios - one day during the first half of August